SUPPLEMENT

TO

THE TELEGRAPHIC JOURNAL AND

Electrical Review.

VOL. X.—NO. 218.

THE TELEPHONE CASE.

In the High Court of Session. First Division, Edinburgh.
Before LORD M'LAREN.

THE UNITED TELEPHONE COMPANY, LIMITED,
v.
ALEXANDER MACLEAN, EDINBURGH.

THIS is a case in which the complainers apply for suspension and interdict against the respondent from infringing the letters-patent bearing date 30th July 1877, and sealed in the Great Seal Patent Office, on 20th October 1877, and numbered 2909, granted to Thomas Alva Edison, for the invention of "Improvements in instruments for controlling by sound the transmission of electric currents and the reproduction of corresponding sounds at a distance," from making, using, &c., the invention described in the said latters-patent and specification filed on the 30th January 1878, and disclaimers and memoranda filed on the 10th February 1880, and 13th June 1881; and also from infringing letters-patent bearing date 9th December 1876, sealed on the 15th May 1877, and numbered 4765, granted to William Morgan-Brown, of the firm of Brandon and Morgan-Brown, London and Paris, for the invention of "Improvements in electric-telephony (transmitting or causing sound for telegraphing messages) and telephonic apparatus," a communication, by Alexander Graham Bell, and from making, using, &c., the inventions described in the letters-patent and specification filed on the 9th June 1877, and disclaimer and memorandum of alterations filed on the 13th February 1878.

The RECORD sets forth first—

(1) The note of suspension and interdict; (2) statement of facts for complainers; and answers thereto for respondent; (3) statement of facts for respondent; (4) pleas in law for complainers; (5) pleas in law for respondent; (6) interlocutors. The whole of which we reprint in full, and in addition give the minutes of amendment of record for the respondent.

I.—NOTE of SUSPENSION and INTERDICT.

Unto the Right Honourable the Lords of Council and Session.

NOTE of SUSPENSION and INTERDICT for the UNITED TELEPHONE COMPANY, Limited, having its principal Office in London,—*Complainers;*

AGAINST

ALEXANDER MACLEAN, Telegraph Engineer, Telephone Contractor, and Electrician, 9 and 13 West Register Street, Edinburgh,—*Respondent.*

That the complainers are under the necessity of applying to your Lordships for suspension and interdict against the said respondent, as will appear to your Lordships from the annexed statement of facts and note of pleas in law.

That, in the whole circumstances of the case, the complainers consider that the note should be passed, and interdict granted, without caution or consignation; but, should your Lordships think otherwise, they are willing to find caution acted in your Lordships' books in common form.

May it therefore please your Lordships to suspend the proceedings complained of, and to interdict, prohibit, and discharge the respondent from infringing the letters-patent bearing date the 30th day of July 1877, and sealed in the Great Seal Patent Office the 20th day of October 1877, and numbered 2909, granted by her Majesty to Thomas Alva Edison, of Menlo Park, in the state of New Jersey, United States of America, for the invention of "Improvements in instruments for controlling by sound the transmission of electric currents, and the reproduction of corresponding sounds at a distance," and from making, using, and exercising or vending, during the continuance of the said letters-patent, the invention described in the said letters-patent, and in the specification filed in pursuance of the provisions thereof in the Great Seal Patent Office, on the 30th day of January 1878, and disclaimer and memorandum of alteration, filed in the Great Seal Patent Office on the 10th day of February 1880, and disclaimer and memorandum of alteration filed in the Great Seal Patent Office on the 13th day of June 1881; and from mrking, using, exercising, letting for hire, or vending any instruments made according to or in the manner described in the said specification as altered by the said disclaimers and memoranda of alteration, or in manner substantially the same; and also from infringing the letters-patent bearing date 9th December 1876, and sealed in the Great Seal Patent Office on the 15th of May 1877, and numbered 4765, granted by Her Majesty to William Morgan-Brown, of the firm of Brandon and Morgan-Brown, engineers and patent agents, of 38, Southampton Buildings, London, and 1, Rue Laffitte, Paris, for the invention of "Improvements in electric telephony (transmitting or causing sounds for telegraphing messages) and telephonic apparatus," a communication from abroad by Alexander Graham Bell, of the University of Boston, Massachusetts, United States of America, professor of vocal physiology, and from making, using, and exercising or vending, during the continuance of the said letters-patent, the invention described in the said letters-patent, and in the specification filed in pursuance of the provisions thereof in the Great Seal Patent Office, on the 9th day of June 1877, and disclaimer and memorandum of alteration filed in the said Great Seal Patent Office, on the 13th day of February 1878, and from making, using, exercising, letting for hire, or vending any instruments made according to or in the manner described in the said specification, as altered by the said disclaimer and memorandum of alteration, or in manner substantially the same, and from infringing in any other way any of the said letters-patent, or to do further or otherwise in the premises as to your Lordships shall seem proper.

According to Justice, &c.

JOHN BLAIR, *W.S.*

II.—STATEMENT of FACTS for COMPLAINERS; AND ANSWERS thereto for RESPONDENT.

STATEMENT 1. By letters-patent, bearing date the 30th day of July 1877, and numbered 2909, Her Majesty granted to Thomas Alva Edison, his executors, administrators, and assigns, the sole privilege to make, use, exercise, and vend within the United Kingdom of Great Britain and Ireland, the Channel Islands, and Isle of Man, for the term of fourteen years from the date of the said letters-patent, a certain new invention, of which invention he, the said Thomas Alva Edison, was then the first and true inventor, that is to say, an invention of "Improvements in instruments for controlling by sound the transmission of electric currents, and the reproduction of corresponding sounds at a distance," as the same invention is described in the hereinafter mentioned specification, subject to a condition that the said Thomas Alva Edison should, within six calendar months after the date of the said letters-patent, cause to be filed in the Great Seal Patent Office an instrument in writing under his hand and seal, particularly describing and ascertaining the nature of the said invention, and in what manner the same was to be performed.

STATEMENT 2. In pursuance and performance of the said condition contained in the said letters-patent, the said Thomas Alva Edison, on the 30th day of January 1878, duly filed in the said Great Seal Patent Office a specification under his hand and seal, whereby he described the nature of the said invention, and in what manner the same was to be performed.

STATEMENT 3. By an indenture, dated the 2nd day of August 1879, made between the said Thomas Alva Edison, of the one part, and the Edison Telephone Company of London (Limited) of the other part, and duly registered in the Great Seal Patent Office, the said Thomas Alva Edison assigned to the said Company the said letters-patent, and the rights and privileges thereby granted.

STATEMENT 4. On the 12th day of November 1879, the said Edison Telephone Company of London (Limited) presented a petition to Her Majesty's Commissioners of Patents for leave to disclaim certain portions of the specification to the said patent, and on the 9th day of February 1880, Her Majesty's Attorney-General granted his fiat, giving leave to the said Company, as assignees of the said letters-patent, to file such disclaimer and memorandum of alteration upon certain conditions therein set forth. The said fiat, and the said disclaimer and memorandum of alteration, were duly filed by the said Company on the 10th day of February 1880.

STATEMENT 5. By an indenture, dated the 12th day of July 1880, and made between the said Edison Telephone Company of London (Limited) of the one part, and the complainers, The United Telephone Company (Limited), of the other part, and duly registered in the Great Seal Patent Office, the said Edison Telephone Company of London (Limited) assigned to the said complainers the said letters-patent as so disclaimed as aforesaid, and the rights and privileges thereby granted; and the same thereby became and now are vested in the said complainers.

STATEMENT 6. On the 23rd day of March 1881 the said complainers presented a petition to Her Majesty's Commissioners of Patents for leave to disclaim certain portions of the specification to the said patent as amended by the said disclaimer and memorandum of alteration set out in Statement 4 hereof, and on the 4th day of June 1881 Her Majesty's Attorney-General granted his fiat giving leave to the said complainers as assignees of the said letters-patent to file such disclaimer and memorandum of alteration upon certain conditions therein set forth. The said fiat, and the said disclaimer and memorandum of alteration, were duly filed by the said Company on the 13th day of June 1881.

STATEMENT 7. By letters-patent, bearing date the 9th day of December 1876, and numbered 4765, Her Majesty granted to William Morgan-Brown, his executors, administrators, and assigns the sole privilege to make, use, exercise, and vend, within the United Kingdom of Great Britain and Ireland, the Channel Islands, and Isle of Man, for the term of fourteen years from the date of the said letters-patent, an invention of "improvements in electric telephony (transmitting or causing sounds for telegraphing messages) and telephonic apparatus," as the same invention is described in the hereinafter mentioned specification, subject to a condition that the said William Morgan-Brown should, within six calendar months next after the

date of the said letters-patent, cause to be filed in the Great Seal Patent Office an instrument in writing under his hand and seal, describing and ascertaining the nature of the said invention, and in what manner the same was to be performed.

STATEMENT 8. In pursuance and performance of the said condition contained in the said letters-patent, the said William Morgan-Brown, on the 9th of June 1877, duly filed in the Great Seal Patent Office a specification under his hand and seal, whereby he described the nature of the said invention, and in what manner the same was to be performed.

STATEMENT 9. On the 24th day of January 1878 the said William Morgan-Brown presented a petition to Her Majesty's Commissioners of Patents for leave to disclaim certain portions of the specification to the said last-mentioned patent, and on the 12th day of February 1878 Her Majesty's Attorney-General granted his fiat, giving leave to the said William Morgan-Brown to file such disclaimer and memorandum upon certain conditions therein set forth. The said fiat and the said disclaimer and memorandum of alteration were duly filed by the said William Morgan-Brown on the 13th day of February 1878.

STATEMENT 10. By an indenture, dated the 24th of September 1878, and made between the said William Morgan-Brown of the one part, and the Telephone Company, Limited, of the other part, and duly registered in the Great Seal Patent Office, the said William Morgan-Brown assigned to the said Telephone Company, Limited, the said letters-patent, and the rights and privileges thereby granted.

STATEMENT 11. By an indenture dated the 11th day of August 1880, made between the said Telephone Company, Limited, of the one part, and the complainers, the United Telephone Company, Limited, of the other part, and duly registered in the Great Seal Patent Office, the said Telephone Company, Limited, assigned to the said complainers the said letters-patent and the rights and privileges thereby granted, and the same thereby became and now are vested in the said complainers.

ANSWER TO ARTICLES 1 TO 11. The letters-patent, specifications, indentures and disclaimers here mentioned are referred to for their terms.

STATEMENT 12. Neither the said Thomas Alva Edison, nor the said Edison Telephone Company of London, Limited, nor the said William Morgan-Brown, nor the said Telephone Company, Limited, nor the complainer's Company, has either licensed, or permitted the respondent to use any of the said inventions or any of the improvements comprised in the said letters-patent, or to make use of the said inventions or improvements in any way.

ANSWER 12. Admitted.

STATEMENT 13. The respondent is a telegraph engineer, telephone contractor, and electrician at 9 and 13, West Register Street, Edinburgh. He has, as the complainers have recently discovered, for some time past been violating and infringing the said letters-patent by making, using, exercising, vending, and letting for hire, the said inventions and instruments, which are constructed according to the said inventions described in the said letters-patent and the said specifications altered and disclaimed as aforesaid, or in manner substantially the same.

ANSWER 13. Admitted that the respondent is a telegraph engineer, &c., at West Register Street, Edinburgh. *Quoad ultra* denied.

STATEMENT 14. In particular, during or about the months of August and September last, the respondent, in violation and infringement of the said letters-patentand of the said specifications altered and disclaimed as aforesaid, made and sold several instruments, and specially nine or thereby telephones, each fitted with a transmitter and receiver, which are constructed according to the inventions described in the said letters-patent and specifications altered and disclaimed as aforesaid, or in manner substantially the same. The said nine or thereby telephones were fitted up by the respondent in or about the said months in the office of Messrs. Millar, Robson, and Innes, S.S.C., Edinburgh. The respondent has also for a considerable time carried on a large business, and is now carrying on a large business in making, selling, and fitting up telephones and instruments, and apparatus constructed according to the said inventions, or in manner substantially the same, though the complainers are not at present able to give particulars thereof or the names of the parties to whom the same were sold by the respondent, who has thus been guilty of infringing the said patents.

ANSWER 14. Admitted that the respondent has fitted up nine telephones within the office of Messrs. Millar, Robson, and Innes, S.S.C., and that he, during the months of August and September last, sold certain other instruments. *Quoad ultra* denied.

STATEMENT 15. The complainers have called upon the respondent to desist from thus infringing the said letters-patent, but he refuses to comply with this request, and threatens and intends to continue, and is in point of fact continuing to carry on his said business, and to infringe the complainers' patents aforesaid. The complainers are thus compelled to institute the present proceedings. The complainers have already suffered, and will yet suffer great loss from the respondents' said infrigement, and their claims of damage are hereby reserved.

ANSWER 15. Admitted that the respondent has refused to comply with the complainers' request to desist from fitting up and selling telephonic instruments. *Quoad ultra* denied.

III.—STATEMENT of FACTS for the RESPONDENT.

1. Thomas Alva Edison, in the specification of his letters-patent of 30th July 1877, No. 2909, No. 6 of process, made thirty distinct and separate claims as his invention. Of these claims twenty-six were disclaimed by his assignees, the Edison Telephone Company, by the disclaimer and memorandum of alteration, dated 12th November 1879, and filed 10th February 1880, No. 7 of process. Of the remaining four claims, one was disclaimed by the complainers by the disclaimer and memorandum of alteration, dated 23rd March 1881, filed 13th June 1881, No. 8 of process. The original thirty claims have thus been reduced to three.

2. The three claims still maintained are as follows: —"*First*, In an instrument for transmitting electric impulses by sound, a diaphragm or tympan of mica, substantially as set forth. *Second*, In an instrument for transmitting electric impulses by sound, the combination with a diaphragm or tympan of electric tension regulators, substantially as hereinbefore described, for varying the resistance in a closed circuit, substantially as set forth. *Third*, The method herein specified of recording the undulations of the diaphragm or yielding material, and the reproduction of sound by such material acting upon a diaphragm to communicate to the same, vibrations similar to the original ones, substantially as set forth."

3. The alleged inventions described in the specifications of the patents founded on were not new at the dates of the letters-patent. The said inventions had been publicly known and used in the United Kingdom prior to said date, and the said patentees were not the first and true inventors of the said inventions.

4. More particularly, the alleged invention forming the subject of the letters-patent in favour of Thomas Alva Edison and relative disclaimers was, on or about July 4 1863, published and exhibited in action before the Physical Society of Frankfurt-on-Maine, by Philip Reiss of Friedrichshoff, by whom it had been known, and used, and employed, and the said invention was published and described in numerous newspapers and scientific journals of about that date. *Inter alia*, it was published and described in Vol. XVIII. p. 225, of *The Polytechnesiches Notiz Blatt*, a journal published in Maintz, under the editorship of Rudolph Boeltger, and circulated regularly in Great Britain, and received amongst other public libraries in that of the British Museum. It was also published and described in Dinglir's *Polytechnerische Journal*, published in Augsburg, and regularly circulated in Great Britain, and regularly received at the library of the Great Seal Patent Office, London, and the libraries of the Royal Societies of London and Edinburgh, and at the library of the Philosophical Society of Glasgow (*see* Vol. C. L. XIX., part 1, page 23). Further, the said alleged invention was published and exhibited in operation at a meeting or meetings of the Dublin Philosophical Society and the Royal Irish Academy in the year 1865, by Mr. Yeats of Dublin. The said alleged invention had also been published in various publications of the Compte du Moncel of Paris in and subsequent to the year 1856, and *inter alia*, in the *Rendus* of the Paris Académie des Sciences of 2nd December 1872, and in Moncel's *Applications de l'électricité*, Vol. I. p. 246, both of which works were circulated in Great Britain, and were received in the libraries of the Royal Societies of London and Edinburgh, the Philosophical Society of Glasgow, and the Institution of Civil Engineers in London. The said alleged invention was also disclosed and published in the specification of the letters-patent of William Morgan-Brown, founded on by the complainers in this process, as also in the various prior publications of the alleged invention by the said William Morgan-Brown hereinafter mentioned.

5. The said alleged invention was also publicly used in or about the months of October and November 1871, at the office of the Submarine Telegraph Company, 58, Threadneedle Street, London, and was also used before or at the same date in the Administration des Postes et des Télégraphes, in France, Russia, Austria, Turkey, Belgium, Switzerland, and other countries. At the Vienna Exhibition in 1874 a similar invention was exhibited in the German section, and in consequence thereof the said invention was publicly claimed by Mr. Clerac, of the French Telegraph Administration, and was the subject of correspondence in various journals, and in particular in the *Journal Télégraphique de Berne*, in or about the month of April 1874: Further, the said alleged invention was published in the provisional specification of William Morgan-Brown's patent, left by him at the office of the Commissioners of Patents on 9th December 1876, and in the specification following thereupon, filed by him in the Great Seal Patent Office, on 9th June 1877.

6. Further, with reference to the said alleged invention of the said William Morgan-Brown, the respondent avers that on or about the 25th May 1876, Professor Graham Bell delivered, before the Massachusetts Institute of Technology (Society of Arts), a lecture upon "Researches in Telephony." This lecture was reported in the journal of the *Telegraph*, a paper published in New York, but circulated in Great Britain, and regularly received at the Patent Office Library and other public institutions, within three or four weeks after publication. In said lecture Professor Bell described and published the inventions forming the subjects of the said alleged patent. An article was also published in the said journal on or about 1st August 1876, describing experiments made in illustration of the said lecture; and the *Expositor*, another journal also circulated in this country, published an article descriptive of Professor Bell's experiments about the 10th August 1876. This last article was reprinted in *The Toronto Globe*, which circulates in this country and has an office in London, and appeared in its issue on or about August 12th 1876. *The Dominion*, also published in Canada, issued an article upon the same subject at about the same time: Further, on or about September 9th 1876 (Vol. XXXV., page 162), *The Scientific American*, a journal very largely circulated in this country, published an article entitled, "The Human Voice transmitted by Telegraph," in which the said invention was described. The alleged invention was also described in 1876, and prior to October of that year, in the following journals circulating in England, and four of which have offices in London:—*The New York Herald*, *The New York Tribune*, *The New York Daily Graphic* (illustrated), *The Boston Advertiser*, *The Chicago Times*, *The Toronto Globe*: Further, on or about the 7th of September 1876, Sir William Thomson, F.R.S., in the course of his presidential address to Section *A* of the British Association at Glasgow, exhibited and described actual specimens of both parts of the said alleged invention, which specimens remained on the lecture table for the inspection of the members, and were, during the whole of the week, open to be examined and handled by any person interested: Further, the said alleged invention was described in the British journal called *Engineering*, on 15th September 1876; and detailed drawings of the instruments of said invention were after-

wards published in illustration of an article contributed by Mr. Conrad Cooke to the journal called *Engineering*, and which appeared on December 22nd 1876. The wood-engravings for the said drawings had been made in London several weeks before 9th December 1876. The particulars of prior publication and prior use given in reference to the alleged invention of Edison, excepting the reference to Brown's specifications, apply also to the alleged invention of Graham Bell; and the like particulars given in reference to the alleged invention of Graham Bell apply also to the alleged invention of Edison.

7. The said alleged inventions do not constitute any improvement to those of a similar description previously in use, and the same are not useful, advantageous, or beneficial, to the public.

8. The said letters-patent, specification, and memoranda of alterations, do not sufficiently distinguish between what was old or was in use and known at and prior to the date of the said letters-patent and specifications, and what was new and claimed as new in the said letters-patent, specification, and memoranda of alterations.

9. The inventions claimed in the said specifications were essentially different from those described or indicated in the provisional specifications, as the said provisional specifications did not set forth the nature of the said inventions as now claimed by the patentees.

10. In so far as the said inventions are novel and useful, the said patentees were not the first and true inventors thereof; but the first and true inventors thereof were persons other than the patentees, and not in their employment.

11. The said specifications and memoranda of alteration do not contain such a description of the alleged inventions, and the manner of performance of the same, as would enable a workman of ordinary skill to put the said inventions into practice.

IV.—PLEAS in LAW for COMPLAINERS.

1. The respondent's averments are irrelevant, and wanting in due specification.

2. The respondent having infringed, and still continuing to infringe the complainers' patent rights as above set forth, the complainers are entitled to interdict as craved.

3. The respondent's averments being unfounded in fact, the complainers are entitled to interdict as craved.

In respect whereof. JOHN BLAIR, *W.S.*

V.—PLEAS in LAW for RESPONDENT.

1. The pursuers' averments are irrelevant and insufficient, and fail in due specification.

2. The respondent not having infringed, and having no intention to infringe, the alleged letters-patent, or either of them, the prayer of the note should be refused.

3. The alleged letters patent founded on by the complainers are null, void, and invalid in respect

(1) The said patentees were not the real, first, and true inventors of the alleged inventions described in said letters-patent and specifications.

(2) The alleged inventions were publicly known prior to the dates of the said letters-patent and specifications.

(3) The alleged inventions were publicly used prior to the said dates.

(4) The said alleged inventions are of no public utility.

(5) The said specifications do not sufficiently distinguish what is old and not claimed from what is new and claimed by the patentees.

(6) The descriptions in the said specifications do not enable a workman of ordinary skill to put the said inventions into practice.

In respect whereof, &c. ROB. MACDONALD, *S.S.C.*, *Respondent's Agent.*

VI.—INTERLOCUTORS.

Edinburgh, 26*th October*, 1881.—To see and answer within eight days, and to be intimated. JOHN M'LAREN.

Edinburgh, 12*th November*, 1881.—The Lord Ordinary allows the answers to be seen, and appoints parties to be heard.

JOHN M'LAREN.

16*th November*, 1881.—LORD M'LAREN.—*Act.* Dickson—*Alt.* Mackintosh.—The Lord Ordinary having heard counsel for the parties, and considered the note of suspension and interdict, answers thereto, and proceedings, Passes the note to try the question without caution, and grants interim interdict against the respondent in regard to William Morgan-Brown's patent (that is Alexander Graham Bell's invention) mentioned in the prayer of the note; *quoad ultra* refuses any further interdict *in hoc statu*, the respondent now judicially undertaking to keep an account of all instruments hereinafter manufactured, or sold, or let for hire by him, in contravention, or, as the complainants aver, in alleged contravention of the letters-patent belonging to them. One word delete. JOHN M'LAREN.

29*th November*, 1881.—LORD M'LAREN.—*Act.* Solicitor-General—*Alt.* Mackintosh.—The Lord Ordinary having heard parties' procurators in the adjustment roll, allows the respondent to revise his answers within eight days; and continues the adjustment and closing of the record till Friday the 9th December. JOHN M'LAREN.

9*th December*, 1881.—LORD M'LAREN.—*Act.* Solicitor-General *et* Dickson—*Alt.* Mackintosh.—The Lord Ordinary, for the reasons stated at the bar, continued the adjustment and closing of the record till Tuesday next. JOHN M'LAREN.

13*th December*, 1881.—LORD M'LAREN.—*Act.* —*Alt.* Mackintosh.—The Lord Ordinary closes the record on the note of suspension and interdict, and answers, Nos. 1 and 16 of process, and assigns this day week for the adjustment of issues.

JOHN M'LAREN.

20*th December* 1881.—LORD MCLAREN.—*Act.* Dickson—*Alt.* Salvesen.—The Lord Ordinary, on the motion of both parties, Dispenses with the adjustment of issues: Allows them a proof of their averments under the "Evidence (Scotland) Act, 1866," on Tuesday, the 24th day of January next, at ten o'clock forenoon; and Grants diligence for citing witnesses and havers accordingly.

JOHN M'LAREN.

MINUTE of AMENDMENT of RECORD for the RESPONDENT.

Leave granted to amend Art. 6 of the respondent's statement of facts.

That the provisional specification left at the office of Commissioners of Patents by Cromwell Fleetwood Varley on the 8th April 1870, and the specification filed in the said office in pursuance of letters-patent, No. 1044 of A.D. 1870, granted to the said C. F. Varley and dated 8 April 1870.

The specification filed in pursuance of letters-patent, No. 2646, 1875, granted to John Henry Johnson, dated 29th July 1874.

The specification filed in pursuance of letters-patent, No. 974, 1875, granted to John Henry Johnson, dated 16th March 1875.

The specification filed in pursuance of letters-patent, No. 483, granted to Peter Jensen and dated 29th February 1876.

The specification filed in the pursuance of letters-patent of 1874-76, granted to Edwin Chabot, executor of George Tomlinson Bousfield, dated 4th May 1876.

The specification of Alexander Graham Bell, No. 174,465, filed in the Patent Office of the United States of America on the 14th February 1876, contained in the *Official Gazette*, of the Patent Office of the United States, Vol. IX., p. 474. A copy of which publication was deposited in and open for public inspection at the library of the Great Seal Patent Office prior to the date of the letters-patent granted to William Morgan-Brown.

The specification, No. 175,971, filed in the United States Patent Office *Official Gazette*, of 11th April 1876, and a copy of which publication was deposited in and open to public inspection at the library of the Great Seal Patent Office prior to date of said letters-patent.

The specification of Alexander Graham Bell, No. 178,399, filed in the Patent Office of the United States on the 8th April 1876, contained in the *Official Gazette* of the Patent Office of the United States, Vol. IX., p. 1091, a copy of which publication was deposited in and open to public inspection at the library of the Great Seal Patent Office prior to the date of the said letters-patent granted to the said William Morgan-Brown.

An exhibition of drawings and descriptions of magneto telephones at Manchester in or about the year 1860, by J. Cammack of 76, Church Street, St. Helen's, Lancashire.

A pamphlet entitled the "Improved Telephones," being a translation of "Legat's Report on Reiss's Telephone," published in London in 1863.

A book entitled "Electricity," by Robert M. Ferguson, Ph.D., published in Edinburgh in 1873.

Scientific American (Supplement), 5th February 1876, published in this country in June 1876.

Articles entitled the "Telephone," "Lacour's Musical Telegraph," and "Experiments in Telephony," published on the 22nd and 26th November, 1875, 11th and 18th days of August 1876, in a periodical entitled *The English Mechanic and World of Science*, at 31, Tavistock Street, Covent Garden, London.

An article entitled the "Invention of the Telephone," in *Telegraphic Journal* of 15th May, 1876 p. 148.

Annales Telegraphiques, troisieme serie, tome iii. p. 613, 1876, published in Paris, and sent to this country about November 1876.

An article entitled a "Summary of Electrical Science" ta the British Association, in a periodical entitled the *Telegraphic Journal*, published in London on the 1st of October 1876.

The hearing of this case was commenced on Tuesday, before the Lord Ordinary (M'Laren). The complainers (the company) were represented by the Lord-Advocate (Mr. Balfour), the Solicitor-General (Mr. Asher), and Mr. C. S. Dickson, instructed by Messrs. Davidson and Syme, writers to the signet; and the respondent by Mr. Mackintosh and Mr. Salvesen, instructed by Messrs. Boyd, Macdonald and Jameson, writers to the signet.

After a brief discussion upon a technical point, the complainers called their first witness, Sir Fredk. Joseph Bramwell, who, in answer to the Lord-Advocate, deposed:—I am a civil engineer in Great George Street, Westminster. I am Vice-President of the Institution of Civil Engineers, and a fellow of the Royal Society. I have for a long time devoted great attention to scientific discovery and invention, and have watched the development of the science which has culminated in the telephone. A gentleman of my acquaintance, when reports that such a result was likely to be achieved, went abroad, asked my advice on the commercial aspects of the discovery. I then devoted attention to the question whether or not it was likely to become a commercial success. I was first professionally consulted in March, 1878. In March, 1880, I became the allottee of 100 shares in the original Telephone Company. That company was united with the Edison Company, and they now constitute the complainers' company. I hold 100 shares in the United Company, representing the 100 shares I had in the original company; and I have added to my holding since. I have studied the Morgan-Brown (Graham Bell's) specification of his patent of 9th December 1876, as amended by disclaimer. I have also studied the specification of T. A. Edison, of 13th July 1877, as amended by disclaimer. These are the specifications of the two patents relied on by the complainers (shown Morgan-Brown's specification).

What do you find disclosed under the 4th and 5th plans of that specification?—Briefly stated, I find plans for reproducing articulate speech at the receiving end of the line, the speech having been uttered at the transmitting end of the line. I find in the 4th plan that that is proposed to be done by having in the line wire one battery with convolutions of wire proceeding from that battery—making at the transmitting end an electro-magnet. Proceeding along the line to the receiving instrument there is a convolution in the same wire, making another electro-magnet. In the neighbourhood of these electro-magnets there vibrates at the transmitting end, a metallic plate under the influence of the air-wave produced by the speaker.

In so vibrating in the neighbourhood of the electro-magnet, it sets up in the wire undulations depending upon the extent of the vibrations of the plates; and these undulations going along the wire set up in the electro-magnet at the receiving end vibrations proportionately to the way in which the plate at the transmitting end was made to move by the speaker. In that way is reproduced to the hearer the speech which has been delivered at the transmitting end. Now, in the 5th plan I find a permanent magnet at the transmitting end surmounted by a convolution of wire, which then proceeds in a line, and at the receiving end is made into convolutions round about another permanent magnet. There is again a vibrating plate which, on being set in motion at the transmitting end by the voice of the speaker, absolutely generates the electricity, and the electricity so generated passing along the wire at the receiving end causes the plate to vibrate in the same manner as the plate immediately operated on by the speaker. No battery is here required.

LORD M'LAREN: Then the difference is in the mode of generating the electric force—the one by a battery, and the other by the action of the voice upon a permanent magnet?—Yes.

LORD ADVOCATE: When the voice acting on the tympanum impels it towards the magnet what happens?—It being surrounded by a coil of wire, produces the electric wave. The polarity changes, and undulatory electricity is set up.

In both modifications of Bell's invention which you have described is there a continuous current of electricity passing along the wire when the mechanism is in operation?—In the second mode there is not, but there are undulations in reverse directions set up in rapid succession—as rapid as it is caused by the speaker—irregular, reverse undulations. But there is still another modification in the plan. Instead of there being at the transmitting end a permanent magnet such as I have described there is an electro magnet—that is to say there is a piece of soft iron which is not a magnet except at the times the current is flowing; and there is a local battery applied to that end only. At the receiving end there is an apparatus of the same kind, and round about the coils and the local battery which makes the soft iron magnetic there are secondary coils, and these are the commencement and termination of the line-wire. The result is that whenever the plate is caused to vibrate, there is induced electricity generated in the secondary coil, and it is this that is transmitted along and operates at the further end. The secondary coil is not the same as on the plan 4; there is only a primary coil there.

What is there common to the operation of these three modes you have described?—Vibration at the transmitting end of a plate capable of inductive action—steel plate or nickel plate put into vibration by the voice of the speaker, and the vibrations occurring in the neighbourhood of the magnet, the undulations are transmitted along the line and produce corresponding vibrations at the other end. Then in all cases there is a closed circuit, which is used to produce undulatory electricity.

Was that novel at the date of Morgan-Brown's patent?—So far as I know.

What stage had telephonic discovery reached prior to that—December, 1876?—It was known in the United Kingdom that you might transmit particular musical tones—reproduce them at the end of a telegraphic circuit—so that a particular tune or note would vibrate a given number of times in a second. At the receiving-station, for instance, a tuning-fork might be employed of exactly the same pitch as the one that was breaking circuit, and that circuit would be made to resound; but a fork of another character would not sound, because the vibrations would not be the same. So that the sound so transmitted was only capable of being received and produced by an identical instrument: and it was not possible to send articulate speech by the making and breaking method. Then as far back as 1863, there was Reiss's invention, in which the making and breaking system was so far employed. There was a diaphragm to which you might play or sing, and which by means of appropriate connections, opened and closed the circuit, and in that way the electricity was sent round, not uniformly, as in the case of the tuning-fork, but at varying intervals; but it was incapable of perfectly reproducing speech.

Was the invention of Bell, patented under Morgan-Brown's patent, novel at its date?—So far as I know. It was the first by which articulate speech could be managed and reproduced. It is a useful invention, and is exactly what people have been striving after for many years; and it has been of great practical importance and utility. In the specification the invention is set forth in a way which would enable a workman of ordinary skill to make and practise it. I should have no difficulty in doing so. I think the invention is perfectly well disclosed in the specification, and what the specification says is, in my opinion, literally correct. I may mention in passing, that by means of the telephonic arrangements which have been completed in London, I have my place of business connected with the Society of Arts. So distinctly are the sounds of the speakers produced at a distance,—including the connections—of a mile and a-half, that I know whether it is the secretary or assistant secretary who is speaking to me. The wire by means of which my place of business is connected to the Society of Arts goes first to Westminster Station, then to Chancery lane, and back to the Society of Arts, which, in a direct line is only three quarters of a mile from my place. A friend of mine, Mr. Barry, has his place of business about 400 yards off. I can ring my bell for him; and instead of our having to meet and talk as we used to, we can communicate with perfect ease by means of the telephone, so that the patentee is well warranted in saying that his invention produces a fac-simile of speech. I have studied a great many of the alleged prior publications and anticipations. My opinion of them is that they carried telephonic invention no further than I have already in outline indicated as being the state of knowledge prior to the date of Morgan-Brown's patent. I have read the alleged prior publications in regard to Reiss's invention; my recollections of what is published in regard to that, is that it is not even a description of the invention of Reiss, but merely a statement of results without describing any of the means by which these results are obtained. In the document containing a list of the prior publications, on which the respondent founds, you will find it stated that in the case of a melody sent a distance of something like 300 ft. only some notes were reproduced; scales also were reproduced with some degree of exactness, but there is nothing in the description itself which would at all instruct me how the invention was to be produced. The results reached are not in the least degree similar to those achieved by Bell's invention, for Bell's invention not only enabled you to catch every word that the speaker uses, but enables you to know who the speaker is who is sending them.

LORD M'LAREN: Is it the fact that articulate sounds could be produced by Reiss's invention?—Occasionally they might, but it is equally the fact that it could not make a fac-simile of the speech that was sent. A monosyllable of one tone might be sent, but certainly not an unknown word of many syllables. I find, in short, that Reiss's apparatus is one where the electricity transmitted is from a centre which is open and broken, not inclosed.

The witness was then taken over several articles in class journals of date 1st June, 1876, and 1st August, 1876, founded on by the respondent as prior publications of the patent sought to be protected, and he stated that there was nothing in any one of the articles which would instruct any one to get at the results attained by Morgan-Brown's patent in regard to the goldbeaters' skin transmitter with a battery in line. He mentioned that that particular construction is disclosed from Morgan-Brown's specification.

LORD ADVOCATE: Have you in these articles disclosed to you the use of an electro-magnet with steel diaphragmal plates without battery?—No.

Have you there disclosed the use of a magnet with a local battery?—No.

Have you the permanent magnet?—No.

What were the defects in the modifications of which the goldbeaters' skin membrane acting in association with the line wire forms a part?—There are two things which render it less good than those features which remain as claimed by Brown—the one is that the membrane, such as goldbeaters' skin, is liable to variation and uncertainty of action, owing to atmospheric and other influences; then we have the one battery in the line wire which, although capable of being worked, is not as good a mode as that where you have a permanent magnet or local battery. The reason of its not being so good is this. You make an electro-magnet by means of a current of electricity circulating. That should be done by a wire of a certain size, and it should by its convolutions extend round a considerable length of the magnet itself. Where you have only one battery, and that in a line wire, you can only have a single convolution because it must proceed along a line. Where you have a local battery, making the iron into an electro-magnet, you can have round about that a secondary coil, the character of which is best stated to be acted upon by the plate. It is also placed near to the pile where it can best be acted upon.

Having disclaimed the combination of the membrane with the line-wire, the patentee still claims three modifications?—Yes; he claims the metallic diaphragm with the electric magnet excited by the battery in the line-wire—retaining the line-wire, but substituting the metallic diaphragm. In regard to the *Scientific American* of 9th September 1876, it describes nothing but results. I have read the article in *Engineering* of date 15th September 1876, which bears to be a record of what Sir William Thomson stated at a meeting of the British Association in Glasgow. I was at that meeting of the Association, but not present in the section where Sir William delivered his address. But having read the address, I do not think there is anything bordering on the description of Morgan-Brown's patent—not even on the descriptions I have already mentioned. There is certainly nothing which would enable any one to make or use the apparatus. Sir William tells what he saw at Philadelphia, but he does not describe the method by which the results could be accomplished, unless that was done by what he exhibited. I am now shown what is described to me as models identical with those exhibited by Sir William Thomson. These models appear to be a modification of what I have described as the tuning-fork arrangement.

Would that have conveyed the idea that it was intended to produce a musical as distinguished from a vocal vibration?—That it was something dependent on the plate.

Do you think that that apparatus in the condition in which you see it would be capable of reproducing articulate speech?—I do not think so. Before December 1876, the most accomplished electrician would not have known of it until Morgan-Brown told him.

Would Morgan-Brown's instructions in his specifications have led you to make an implement like that?—No.

Or would an inspection of that apparatus have suggested to you the kind of apparatus which Morgan-Brown describes?—No; it would have led my mind away from it to the instruments where vibration is due to a particular piece of steel, which was then well known. I don't think any of the other alleged anticipations come so near as those I have just mentioned. The model to which I have been speaking has never yet been got to reproduce articulate speech. I am now shown the respondent's transmitter and receiver. There is here, in the receiver, a permanent magnet, and upon the side of one of these magnets there is a prolongation of soft metal, and in proximity there is a steel plate carried round about, so that under electrical influences sent along the wire the magnetism is altered, and that causes movement in the diaphragm. That is on the principle of plan 5, or the modification of it, where a permanent magnet is employed. The form of the magnet is not material.

Is that a clear infringement of the complainers' patent?—Of course that is for his lordship to say. It is obtaining the same ends by practically the same means. No. 55 of process, now shown to me, is the ordinary Bell receiver, and there is in the shank a prolongation in soft metal, surrounded by a spool, which is surrounded by the wire, and here you have the plates capable of inductive action.

Is there any difference between the two except the substitution of the horse-shoe magnet?—That is of no consequence. Brown's specification would cover a magnet of any form. The straight magnet is used by the company now.

Passing now to Edison's patent, as it was originally taken out it contained about 30 claims?—Yes, as is the habit with American patents. (A laugh.) They go on the principle of claiming everything. By disclaimers, however, the claims have been reduced to three. That patent relates to the controlling of the electric current for sending sounds to a distance; one of its traits relates to a mode of making plumbago which, according to Edison's plan, is capable of inductive action; another relates to various tension regulators; and a third to the recording of undulations that may be reproduced at an interval of time. This method of using it is the transmission of sound. In regard to the second of the features I have just mentioned, the circuit is closed where these regulators are used. That is distinctly stated in the specification.

Explain the meaning of the phrase he employs "varying the resistance."—He proposes that you should use a battery which could either be connected directly to the line-wire, or be connected to a primary coil, having a secondary coil. Then he says that if you can vary the resistance to the passage of electricity for this battery, you will attain that change in condition necessary to put the receiver into operation. In this way he obtains much more powerful effects than can be obtained by Morgan-Brown; for Edison dependes only on the voice for setting up any changes of inductive action. It was in short an imperfection in Bell's instrument that he had a weak transmitter, although of course it was superior to anything that had gone before. The conditions of the electricity limited its power; the operative electricity was set up by the inductive action of the plate which was set in motion by the persons speaking. Take water as an illustration. According to Brown you had to set it in action by a motion of your hand. Edison comes and says, "Let the water be set in motion by a superior force, one of your hands to regulate the stop-cock."

Would what Edison does correpond to producing waves in flowing water?—Yes.

Whereas what Bell did would correspond to producing waves in still water—not a volume going in one direction?—I rather take my own illustration.

LORD M'LAREN: I thought one of the modifications of Bell's system was to create a current independent of the action of vibration of the plate?—I quite follow your lordship; but there is super-imposed upon the current, or deducted from it, that which is the value of the vibration of the plate operating by inductive action; but that is a different mode from Edison's. He operates by controlling the facility with which the current is sent.

Under plan 4 you would necessarily get a greater extent of force, because all that you obtain is that instead of setting in motion a fixed amount of force, you diminish the force already in operation?—Yes.

But the intensity would still depend on the action of the vibrating plate?—Yes.

Whereas in Edison's process you use the vibrating plate merely to regulate indirectly the current generated?—Yes.

LORD ADVOCATE: In other words, "varying the resistance," or varying the facility for transmission?—Yes.

SIR FREDERICK then gave a technical description of Edison's tension regulators with reference to the drawings and specifications, his evidence on this point being directed to explain how when any one speaks the varying pressure of the black tension regulator is sufficient to cause a change in the conducting power, and to produce at the receiving end those vibrations which are intended to be produced; remarking that the black regulator might be, in the words of the specification, bunches of semi-conducting elastic fibre, or conducting materials having a deposit of metal on their surface, or a disc covered with plumbago, or other semi-conducting material, or it may be lamp-black retained within a case.

LORD ADVOCATE: Is there any quality common to those different materials?—They are all imperfect conductors—they vary in the amount of conductive power.

In order to be of value to transmit speech must that power of variation be exceedingly sensitive?—Yes.

So as to respond to every change of tone and quality of voice?—Yes; both as regards rapidity and strength. The electric current so changed is transmitted to the receiving end. Those changes that have just been referred to cause the plate of the Bell receiver to respond. In point of fact the United Telephone Company use the Edison transmitter and the Bell receiver. They use the primary and secondary coils wherein the changes are caused by the effect of the voice upon the carbon pointed regulator, the currents being sent along the line wire, which is in connection with the Bell receiver. These are really the implements by which these marvellous results are obtained. I think the carbon has a special virtue in connection with these matters; at all events it is in almost universal use. I have already mentioned the qualities it possesses; its most prominent quality is its capability, under the most minute differences of pressure, to enormously increase or decrease the resistance of the circuit. In point of fact, these carbon substances, some of which have been mentioned, in a sense regulate the tension.

What does the patentee mean by tension?—Variation in the current.

The apparatus does in fact regulate the strength of the electric current?—Yes; and these pieces of apparatus are appropriately enough described as tension regulators—the voice by means of the carbon regulators is enabled to deal with the current, so as to send stronger variations along the wire than could be sent if these variations were simply generated by the voice.

You mean that the variations are effected so as to produce with remarkable fidelity the vocal changes which occur?—Yes.

According as the carbon is compressed or relieved from compression by the gentle impacts of the air set in motion by the voice?—Yes. It hardly amounts to compression for it is imperceptible; yet we suppose it must be compression.

Have you any doubt that the invention as described was novel at the date of the patent?—None.

LORD M'LAREN: Was it only novel in its application to the telephone, or was it a new invention altogether?—It had been used for the purpose of varying the current from time to time by hand regulation, but when so used there were no means by which the current could be influenced, *i.e.*, it was used as a means of making a permanent variation of the current, but it could not be used so as to act automatically.

LORD ADVOCATE: Do you think that the new application involved merit and invention?—Certainly; it was anything but obvious in my opinion.

Did it supply a desideratum that everybody struggled after?—Yes, and the result is the commercial telephone. I consider the invention as of great public utility. I am further of opinion that it is so described that a workman of ordinary skill could make and practise it. I have read the various publications which are relied on as prior publications—amongst others Du Moncel's application of 2nd December 1872, but I don't find any disclosure of Edison's invention there, for what Du Moncel claims does not conduct the current at all, or if it does it is only very indifferently. The powdered charcoal introduced into M. Clerc's tube mentioned there was screwed down, so that when that condition continued to exist, the capability for transmission remained the same. There was no arrangement for compressing it automatically, or when once compressed to get it to re-assert itself. The only thing that could be done was to unscrew it, and shake up the particles.

SIR FREDERICK was then shown a model of Theiler's apparatus, and described its chief features.

LORD ADVOCATE: Is there any feature of that apparatus which is not described and claimed by Edison?—To my mind none of the important parts.

Does what is called variation of resistance in Theiler's, as in Edison's, depend on minute shades of difference in the pressure?—Yes.

Is carbon used there in the same way and for the same purpose as in Edison's?—Yes. I think it is entirely within the description and claims of Edison.

Any change is in the shape of needless multiplication of the pieces of carbon?—Yes, but a perfectly harmless multiplication.

LORD M'LAREN: Do you think the introduction of a cross piece is an improvement?—I don't think so, but even if it is I do not think it would take it out of the disclosure by the complainers. Theiler does not mention carbon, but I find him using it, at least I have no doubt the material is carbon. It is Theiler's system which the respondent makes and sells.

LORD M'LAREN: In your judgment that apparatus whose soever it is comprehends the novel and essential features of Edison's electric tension regulators?—It appears to me to be entirely within that which is the subject of Edison's second claim.

Cross-examined by Mr. MACKINTOSH: Does Mr. Edison include in his claims all the forms of electric tension regulators?—No; only those that he has described.

On being asked what passage in the specification describes most closely the respodent's electric tension regulator, the witness referred to several passages.

The resemblance consists simply in this, that you have pressure producing resistance in a closed circuit, and thereby increasing or diminishing the strength of the electric currents?—Yes, and the pressure being produced by the tympanum.

And any instrument proceeding on that principle would be within Edison's patent?—No; only if it contained these tension regulators as described in the patent.

Is it your view that with a tension regulator, operating by a diaphragm, which diaphragm produces pressure upon a portion of the circuit, and thereby diminishes and increases the resistance in that portion of the circuit, that then the instrument is within Edison's patent?—I cannot tell you unless you give me a specific instance. I do not suppose Mr. Edison has made a general claim.

Is that not implied in what you have said in your previous answers?—I think not.

Is there any other feature in the figures before you common to the respondent's and to Edison's instruments except those I have mentioned?—No, except this, that I understand the respondent uses a material forming one of the tension regulators.

Then you had a community of material?—Yes, and a substantiality of construction of the tension regulator.

Where a similar material is chosen, and where you have a diaphragm producing pressure upon the electric tension regulator in a close circuit there you have Edison's invention?—Yes.

Is there any one of the tension regulators which are described in Edison's specification in commercial use at this moment?—Yes; I do not know a transmitter which does not employ what I believe to be the tension regulator described by Edison.

Is it not the fact that the Edison Company have employed a different transmitter from any of those described in the sheet of drawings?—Yes, different as regards the form; no, as regards that which is covered by the second claim, according to my reading of it. I have been informed that Edison took out a subsequent patent in 1868.

LORD M'LAREN disallowed examination on this patent on the ground that the patent in question can have no effect in limiting or construing the invention of Edison as disclosed in his previous specification of 1877.

[Discussion on this point lasted nearly an hour.]

EXAMINATION CONTINUED.

I am of opinion that the weight in the transmitter used by respondent was equivalent to the spring used in the Edison instrument, and that they both produce precisely the same effect.

The witness further said that although in the Edison tension

regulator there was an adjusting arrangement, it had only to do with primary adjustment, that the pressure depends on the strength or weakness of the vibrator, and the strength or weakness of the vibrators and the vibrations of pressure on the regulator, and that this is precisely the case in the instrument used by the respondent. Could not believe that the resistance was varied by a jolting motion; could not conceive a jolting motion producing variation and difference of pressure, and such an instrument could not be relied on, and therefore would be practically useless.

In answer to the suggestion that the difference in resistance might be caused by the number of points in contact, and the particular points in contact, witness said such an arrangement would be of no practical utility, as it would never be known what it was to do.

Shown a specimen of Professor Hughes' microphone, as described to the Royal Society in 1878, and asked if he regarded it as being within Edison's claim, witness expressed great reluctance to enter on this point, on the grounds of friendship with Professor Hughes, and the animated discussion which has taken place between the professor and Mr. Edison. Pressed for his opinion, he said he believed it did come within Edison's claim.

Shown Crossley's transmitter, expressed his opinion that it too was within the claim. Did not believe that iron points of contact would give as good result as carbon, because they were good conductors; could not say whether platinum would produce the same effect as iron nails; that a feature of all the materials which Edison requires for his regulator is that of elasticity, such as carbon (?), and that where this feature is absent they have a spring; that all the materials used are semi-conductors, whereas iron nails and platinum are not semi-conductors. Patentee says what materials are best suited for discs, and names mica, that the discs are covered with plumbago, but does not warn against any form of disc, and says nothing as to size or thickness.

Considered the diaphragm in the Theiler and other instruments essential to their good working, that it serves no other purpose than that of giving out the sounds; but if withdrawn the instrument would not work, or if it did so badly as to render it commercially of no utility.

Asked if in his opinion Edison's claim of 1877 covered carbon, believed it did so, in so far as he specifies plumbago, which is only another name for carbon, admitted that it was a form which always went under the distinctive name of plumbago; had no doubt it would serve the same purpose as retort carbon. Was not aware of any special reason for the general use of retort carbon, perhaps it was because of its cheapness and easiness of supply. Did not know that charcoal oxidised when in a condition other than powdered.

Retort, although not elastic, was still sufficiently so for the inappreciable pressure required.

EXAMINATION CONTINUED.

Bell claimed nothing within his patent that did not produce articulate speech. Surprised to hear that Reiss's instrument ever spoke at all. Did not believe that the address of Sir Wm. Thomson before the British Association at Glasgow anticipated the patent; that the instrument then shown did not and could not be made to produce speech, although Sir Wm. Thomson believed it to be a fac-smile of the one he saw at the American Exhibition. In his opinion the writer of the article in *Engineering*, commenting on the address of Sir Wm. Thomson, had no notion, that all that was required was the freeing of the disc.

EXAMINATION CONTINUED.

Had never seen or heard the instrument described by Mr. Yeats, of Dublin, and had never met any one who had; nobody heard of it till the dispute between the company and the Post Office; and if it had been effective it would not have been so carefully kept a secret from 1863; had always treated is as a good joke. Was of opinion that the carbon in Theiler's instrument and plumbago performed the same functions, were there for securing the same end, and were of similar material. Reference being made to the invention of Barlow, the witness said it differed from Edison's phonograph in that while the former simply recorded, the latter reproduced what it had received; that it was the primary idea in the specification, and that he had no reason to doubt that Edison had the reproduction in view.

(Court rose to meet to-morrow, Wednesday.)

WEDNESDAY 25th.—The Court resumed its sitting this morning at 10 o'clock.—There was a much larger attendance of the public than on the previous day.—

The first witness called for complainers was SIR WILLIAM THOMSON, who deposed: I am a professor of natural philosophy in the University of Glasgow and a president and fellow of many scientific and learned societies. I have devoted much time and attention to the development of electrical science.

LORD ADVOCATE: You have given a very great deal of study to electrical science and made many inventions and discoveries? You have watched with great interest the delopment of the telephone generally?—Yes; from the telephone of Reiss to the articulating telephone.

Reiss's telephone was not an articulating telephone?—No.

You are accquainted with the inventions of Reiss, Gray, Varley, La Cour and others; could you explain in any general way what distinguishes them from the Reiss telephone?—The Reiss telephone is somewhat distinct from the other telephones of Varley, La Cour and Gray, in respect that Reiss telephone consisted in a make and break, actuated by a membrane which membrane could respond to different notes—the make and break produced by the instrument would transmit sounds of different pitch to distances within certain limits.

Is it true that Reiss's, Varley's, La Cour's and Gray's were on the make and break system?—Yes.

So that they do not proceed on a close circuit? And were therefore inconsistent with the production of articulate speech?—Yes; make and break might accompany articulation, but it would produce a disturbing element, and in so far as make and break is introduced it is a defect to articulate speech.

You are acquainted with the apparatus of Bell. To the best of your knowledge was there any apparatus previously invented which reproduced articulate speech?—I believe there was no such instrument, and that he was the inventor of a method for reproducing articulate speech.

You were one of the Judges at the Philadelphia Exhibition, and when there was your attention called to some devices of Bell for reproducing sounds?—Yes.

And to those of Gray and prior investigators?—Yes.

Were they intended to be used as harmonic telegraphs?—A combination of them was intended to be so used. Mr. Bell explained that by an arrangement of a number of such instruments he would be able to make a speaking instrument.

Were these make and break instrument?—Yes; I believe so.

Were they capable of transmitting the morse and other forms of alphabet?—Yes, and were so far as shown make and break.

Were those shown to you by Bell capable of vibrating? had they all the common quality of musical vibration and capable of producing a fixed note?—Yes.

But not capable of transmitting articulate speech?—No.

Did he show you many varieties?—Yes.

They were not so new as something you were shown afterwards?—No.

He did show you a number of those which were vibratory?—Yes.

After Bell had shown these did he show you anything else?—Yes, he showed us something which he said he would hardly call an invention, but which might ultimately become an invention.

What did he show you? (The witness was here shown the telephone given him by Bell). The telephone shown, was it to be used in connection with a battery and a line wire?—Yes.

What did Bell say about them? He said he could show us something which would speak, and on that occasion, in presence of the Emperor of Brazil, and after some troublesome adjustment, it was made to speak. I heard the vowel "O" and "to be or not to be," and "there's the rub."

He stuck to monosyllables?—Yes.

And was this after troublesome adjustment and many orders to his assistant and he had tried to see whether it would do?—Yes, I felt so very much interest that I went too far and said the thing is done. I urged Mr. Bell to go on, and before the close of the meeting he had improved his adjustment. My friend, Professor Watson, heard it very faintly. It required very minute attention, but I am absolutely convinced myself that I did hear it.

Was that after careful and troublesome adjustment?—Yes.

Did you understand what Bell was after?—Yes, one thing was the adjusting of the membrane which was liable to be put out by the breath of the speaker, and another the adjustment of the battery which I knew to be a difficult one. The only way it could be heard was by the ear being pressed upon the disc. If pressed too heavily it would kill the sound and if too little the same result ensued. The great difficulty was the adjusting the ear.

On the only occasion in which you heard at the receiver shown by Bell at Philadelphia, was the piece of metal free and separate at one point?—Yes.

When you heard it was it fulfilling the purpose of a vibrating tongue?—Yes, my impression at the time was that when my ear pressed too hard there was no sound, and when too light there was no sound.

Was the instrument shown you by Bell commercially useful?—No.

Was it an invention in the course of discovery to make it commercially useful?—Yes; and I did all in my power to encourage Mr. Bell to proceed.

Was there anything in what Mr. Bell told you to enable you to make a telephone?—No.

He gave you instruments?—Yes.

And what did you do?—I tried them, and worked a good deal with them. I tried various combinations of battery power, but all with no effect.

Did you fit it up in precisely the same way as Mr. Bell?—Yes.

Did you get any instructions from Mr. Bell which would enable you to fit it up and make it speak?—No.

How long did you continue your experiments?—For some considerable time, making several experiments, but never got it to speak a word. Other duties necessitated my laying it aside for a time.

When you got the instrument from Bell, in what position was the tongue at the top. Was it screwed down at one side and free in its other parts?—Yes.

Was that part sticking up at the angle which it now is?—Cannot exactly say, as it appears to have been moved.

(To be continued in our next.)

The full report of this case will be issued in a separate form *as soon as possible after its completion*. Price 6d., by post 7d. per copy. Haughton & Co., 10, Paternoster Row, London.

THE POSTMASTER-GENERAL AND THE TELEPHONE.—Since the article with this title was in type, it has been freely rumoured, both in London and Edinburgh, that the Government are about buying-up the telephone interests. It was a wise course, in sooth, to grant practically a monopoly, and then think of buying-up!

CITY NOTES.

Old Broad Street, January 25th, 1882.

THE ANGLO-AMERICAN BRUSH ELECTRIC LIGHT CORPORATION, LIMITED.

THE first annual meeting of this corporation was held at the Cannon Street Hotel to-day, Mr. Henry W. Tyler, chairman. There was a large attendance.

The Secretary having read the notice convening the meeting, the report (an abstract of which was given in our last issue) was taken as read.

The Chairman said that it gave them great satisfaction to have the pleasure of meeting the shareholders at the end of the first year of their existence. They would be aware that they only started in December, 1880, and therefore they have just been the year at work. It was true that in a business of this description they had very many difficulties to contend with. They had had to organise machinery for manufacturing, they had had to organise a staff for working it, and also the staff for making their arrangements and putting up their lines in different parts of the country. Any one, the Chairman continued, who knows what it is to collect together proper machinery of the new description for new manufacture will probably appreciate something of what we have gone through (hear, hear). We have chosen the earliest possible time to meet you, and on this subject I will just say that before the middle of last year there were one or two gentlemen who were very anxious then to have a meeting and to have the accounts of the corporation submitted to the shareholders. Our articles provide that our meetings shall be annually, and that was one reason for not having the meeting as proposed in the middle of last year. It would have been a most unfair thing to the company and to you, the shareholders, to have stopped our staff to check the accounts so as to submit them for a concern that had only been working for six months, for during that time it was impossible to have made any progress satisfactory to you or satisfactory to us.

I think that what we have done in twelve months is really most gratifying. As you will have seen by the accounts, we have really returned to you, we may say, in one sense, more than half of the whole capital of the company during that twelve months. Now, I am not going to enter into full particulars as regards these accounts. I have heard it observed that our report is rather a short one, and our accounts are concise. We have made them so on purpose, and for this very good reason that we have a great many rivals in the field who would be very glad to know a little more of what we have been doing. We have so many negotiations with other countries, we have granted many patents and licences in this country, we have other patents in negotiation with foreign countries and negotiations with different counties of England, and much of these negotiations has to take place yet, and we cannot place in detail before you precisely what we have done in many of these instances; and therefore I will ask you to excuse me from giving details of what I or any member of the board would be glad to tell you if it were for the interests of the company to reveal all its secrets, and all the details of our operations (hear, hear). You will see that the net profit for the year, as given in the account which I suppose will be taken as read, is £134,965, 6s. 1d. and that of that amount £99,500 in cash and shares have been derived from the sale of patents and concessions, while £38,463 6s. 1d. has been derived from manufactures. We laid down this principle, and I think you will all agree with it, that whatever, upon a review of accounts was fairly derivable from profits of manufacturing, we should divide in dividends, and whatever came from the sale of patents and concessions we should put to the reserve fund. I think that is a sound principle to act on, because in a business of this description we never know what may happen in the future, and what new inventions may be brought to bear, or new principles invented, and therefore I think, as time goes on, should we continue to prosper that it will be wise in us to reduce our present capital and so make it more easy in the future to divide dividends on the capital we have left. Of that £99,500 we have received in cash and shares, about half is in cash and half in shares. These are in three companies, and of course I cannot pretend to estimate what will be the value of these shares in future. We have taken them at par value; we could put no other value at present on them. I venture to say we will not be far wrong in so doing; for if the shares of one company are a little below, the shares of the others may be above par, and I hope that is not far from being their value at the present if we put a par value on the whole of them (hear, hear). You will observe that we have not left any charge in future years as regards preliminary expenses, and we have also written off, though perhaps it was hardly necessary to do it with new machinery, at the rate of ten per cent. for depreciation of plant and machinery, and we shall propose to continue that in future years, so that after ten years the plant and machinery will have paid for itself. In the course of beginning our operations it was with doubting minds that we first went to inspect some premises in Lambeth. There was a large building, or rather two large buildings, the one having three floors, each measuring 100 feet by 47 feet, the other three floors measuring 60 feet by 37½ feet, and another large building besides, with a good yard —capital premises altogether. We went with doubting minds to see whether that was not too large for us, whether we were justified in going to the expense of taking so large a factory to begin our manufacturing in, but we had not been long before we had filled that building completely with our machinery. We have 85 lathes, 31 drilling and other machines, 12 milling machines—in fact, we are absolutely blocked up with our manufacturing, and we are now erecting further buildings in the yard for a new testing-room. The first thing we were supplied with in the way of engine-power was one of 120 horse-power, and now we have two more of 150 horse-power each. We have not only completely crowded the building, but we have got some excellent offices adjoining, into which, as those will have seen who have looked into them, we have overflowed from that building, and in which we have now two other factories (hear, hear). Our profits have been made at the first building up to the present; but we look not merely to the present but to the future of electric lighting, and therefore in addition to the Brush electric system of dynamo machines, we have acquired the patents of Mr. Lane-Fox, which we believe to be by far the best system of incandescent lighting, and a special manufactory for the manufacture of incandescent lamps, and apparatus connected with it, has been established at Portpool Lane, not far from our original offices in Hatton Garden. There are three floors admirably suited for our purposes, measuring 100 ft. by 70 ft., and where we have two engines of 150 horse-power. At these places we employ 332 at Belvedere Road, and 124 at Portpool Lane, altogether 486 men employed in our manufactures. But before long, if our system develops so rapidly—we have at this moment 4,000 orders in hand—1,000 men will be fully occupied (hear hear). But finding that these buildings were unequal to our necessities, we have taken another building larger than both put together in the Borough Road. This enormous building has five floors, measuring 200 ft. by 50 ft.,—two engines of 80 horse-power, and we shall be obliged to supply extra machinery very shortly. So that you see, although we began in a cautious manner, and felt our way, we have by degrees got into a very large manufacture. We have considered very much the question of electrical lighting, and what we should do as to the undertaking the lighting of towns, &c., and we have felt that it would be hardly a prudent operation to undertake all this business, which would need a very large capital and an enormous staff and require more superintendence than could be taken in hand by any one company of this description, and therefore we would rather sell our concessions for different counties, and induce other companies to undertake these detailed businesses so that local influence might be brought to bear, and the services of many gentlemen acquired not directly connected with this company, and we believe that in that manner by so employing other people, not only will they make large profits, but we shall be able to make larger profits for ourselves, and so that by and by we shall have a large number of companies in England, Scotland and Ireland, and we shall be able to supply them all with machinery, and make all the profit we can out of it. Of course we have been obliged to spend some money which brings in no direct return, such as the exhibition expenses. We had a fine exhibit at the Paris Exhibition, which may be conducive to the extension of our system in France, and already the Grand Opera House in Paris is lighted with our lights successfully. We were obliged to spend a good deal of money there, and a good deal at the Crystal Palace, where our exhibition now is. I grudge money that is so spent, because there is no direct return for it. But it does not do for us to fall into the background, and we must do what we can with a view of extending our operations. But we don't indulge in those other extravagances in which other rival companies do indulge, *i.e.*, in doing a great deal of work without being paid for it, and providing with light, houses of certain influential gentlemen who, doubtless, are expected to give some indirect return for expenses so incurred. We conduct our affairs on strictly business principles, and even if our directors want anything out of our works they have to pay for it. That is the proper way, and not to throw money away upon people who may never give you any return. Now, to show you that our Brush system is really an assured success, I may first mention the number of machines and lamps sold up to the present time. In England we have sold 220 dynamo-machines, and 2,711 arc lights; but in the United States, where it has been longer at work, and where coal is dearer and there is more opening for rapid development of such a system, they have sold 880 dynamo-machines and 12,451 arc lamps. I believe that 10,000 have been sold during the past year. We are sometimes told that the arc lamp is going out of fashion, and incandescent lamps are taking their place. There is the reply: that people are continually demanding them, and that during the past year 10,000 have been sold. There is a good deal more to be done in that business yet in other countries besides America. The arc light of course is more adapted for open places, streets, factories, and large manufactories of every description, whilst the incandescent light is more adapted for domestic purposes, theatres and other buildings of that description, and I hope there is a great future for both of them. As regards failures, we will admit that some of our lamps have not burned quite as well as might be, and have not been such a perfect success in some places as in others. It is not wise to hide these matters—we should look them in the face. In all cases of failures, however, the causes have been simple. In sending people all over the country we have not been able to get always men well qualified to work our machines. It is a very difficult thing to obtain a good supply of men for such work. That is one of the principal reasons of failure. These men have not always known how to put down all their connections—indeed we ourselves have not always thoroughly known it. When hanging our wires in the City we threaded certain wires through metal tubes covered with gutta-percha; we found out afterwards that it affected them. In any new business you must learn from your failures, and that is the only way to get on. But in the failures it is not the system that has failed, but the application of it—it has been simply some stupid little mistake in applying it.

We have had great success in manufacturing our machines and lamps. We were told that it would be difficult to make these machines, but we have had wonderfully few failures.

The wear and tear of the apparatus is very slight—very little indeed. It is almost nothing compared with other machinery, and some of the lamps are better at the end of twelve months than they were at the beginning.

We have heard from time to time about the dangers of electric lighting. Now I do not deny that there are dangers. Let us look this matter also in the face; we saw lately of a fatal accident in which one of our machines was the culprit. It was not done by ourselves, for we were not concerned in the arrangement of the lighting. We were asked as a favour to lend a gentleman a machine for the purpose of some illuminations at a garden party, and we gladly complied. Instead of using wires covered with insulated coating, they put naked wires along a garden wall where they were arranged to run, and a poor fellow put his hand on them and was killed. Every apparatus used in this careless way will produce accidents; there was no occasion to apply naked wires, and there is danger in anything else you may use in that loose way. The wires require to be properly insulated in houses; it is necessary that they should be put down in a careful manner, or accidents of every description will occur. The precautions are most simple, and perfectly well understood, and if adopted, there is no danger from electric lighting. When you compare the electric light with other descriptions of lighting—candles, petroleum, gas—it is perfectly safe as compared with any one of them. After remarking on the dangers attending the careless use of candles as a domestic light, the chairman spoke of petroleum and mineral oils in causing a long train of casualties by fire, instancing particularly the burning of Chicago. He read various extracts from recent daily papers as bearing on the dangers of gas—both from explosions and from fires—and therefore, he remarked, anybody who talked about the dangers of electric lighting should look at the dangers which spring from these other common sources of illumination. Reverting to the Brush Electric Light, he said: I was very much pleased the other morning to see the behaviour of our light for the first time in a real London fog. I compared it in Cheapside with the lights of at least two other companies, and looking to the great height of our lamps and the amount of light they diffused, I think it compared most favourably with its rivals. (Hear, hear.) In a visit, to a South Wales iron works, which I recently paid I was also very much pleased at the testimony of the manager and of the hands to the efficiency of our system, enabling them as it did to work by night with as much freedom as in the daytime. If there are any gentlemen here connected with iron works, they might consider whether we might not be of the same use to them.

We claim to have both the best system of arc-lighting and the best system of incandescent lighting, and whatever other discoveries or inventions may be made, we intend to keep in the van of all other systems and companies. I have told you a little of the difficulties we have overcome at the outset, and I believe these are difficulties the other companies have not been able to overcome as well as we have done. I have not heard of any other company that has made progress in this business, and we have made very considerable progress. I don't wish to mislead people by saying that because we have made progress therein they should buy shares in other electric companies. That does not follow. When hæmatite pits were sunk at Cleater Moor it was the ruin of all the other people in the neighbourhood, for they too sank pits and did not get any hæmatite. And in the same way with reference to other concerns. All the attention we can give to this company we shall give to its business, and do our best to give you as good a return for the second year of our existence as for the first.

I beg to move that the report and accounts be approved and adopted.

The Vice-Chairman, John Scudamore Sellon, Esq., seconded the motion. He had associated himself with this company as a great enthusiast in electric lighting in general, but afterwards he became a special enthusiast in the Brush system, because, after the examination of most of the others, he felt there was in the Brush system elements of success which he could not see in them, both as to economy and safety in working and as to successful results as a light producer. He thought they were fully justified in believing what the chairman had told them, that they had the most complete system of electric lighting, certainly the best dynamo machines, and the best system of incandescent lighting in addition. Their opponents might call in question their judgment, but he could only use the old saying, that the proof of the pudding was in its taste, and the proof of the good quality of their system was its success. The introduction of Brush lighting into England had given great impetus to electric illumination, and they certainly ought to receive the thanks of the public for having *brushed* up the gas companies a little. They need now to give a better article at a lower figure, and to serve their customers instead of being their masters.

Referring to attacks made upon the Brush system, he said that they had avoided useless controversy, but they had replied by the infallible test of ever-increasing orders and extending influence. There was far too much made in the newspapers of every little failure of the Brush lamp; but that showed that the eye of the public was on them, for other companies might fail over and over again and no notice was taken of it. In the case of their failure in the City, where the wires had to be taken up from the tubes and replaced—the total cost of doing so was probably £10, taking a dozen men only a day or two. An article had recently appeared in one of the electrical papers which was a diatribe against their system, based upon the fact that in the work they had undertaken in Edinburgh the wires were suspended from lamp to lamp. He granted that that was an unscientific thing. No one would dream of holding it up to imitation. But this was a temporary engagement for a period of three months for a special purpose and for the specific occasion, and laying aside the question of the necessary time, the expense of laying wires in the streets would have amounted to three or four times the whole amount for which they had contracted to supply their lights. They did not complain of criticism, but they did complain of unfair and wilful perversion of facts. He believed that the neck of the position was certainly broken, and that they had an excellent prospect of making rapid and satisfactory progress. He begged to second the motion put to the meeting.

Mr. Abbot, after congratulating the meeting on the favourable nature of the report, said that there was one point not referred to either in the report or in the chairman's address, and that was whether the firm of Messrs. Hammond & Co., which had done such excellent work for them, had still business connections with the Brush Company, and whether such connection would continue in the future.

Major Leslie said that he had one question to put which might probably he considered premature. The chairman had hinted at the return of capital. They had two classes of shares, fully paid up £10 shares, and £10 shares of which £4 had been paid, and both of them at an immense premium. If any capital should be returned, he would like to know upon which class of shares that would take place? as the matter involved an important principle.

The Chairman said that they had a new scheme before them, for returning the capital. He had merely shadowed forth the idea, and it was only an idea that lay in the future. He thought that they must wait till they had a definite scheme on the subject to bring forward before broaching the principle of Major Leslie's question. In reference to the question of Mr. Abbott, the Hammond Company was of course a quite independent one, worked on its own basis. They hoped that the connection of the two companies would be most intimate and profitable to both.

The motion was then put to the meeting and carried unanimously.

On the motion of the chairman, Charles Dormer, Esq., Essex Street, Strand, was elected a director in room of Thos. J. Montgomery, Esq., who retires by rotation.

The two other directors who retired by rotation, W. M. Bullivant, Esq., and Fredk. Nettlefold, Esq., were then re-elected.

The auditor, Mr. A. E. Jarvis, was also unanimously re-elected.

This closed the proceedings.

THE DIRECT UNITED STATES CABLE COMPANY, LIMITED.—We are informed that the board of this company have resolved upon the payment of an interim dividend of five shillings per share, being at the rate of 5 per cent. per annum for the quarter ending 31st December, 1881, such dividend to be payable on and after the 16th February next.

GREAT NORTHERN TELEGRAPH COMPANY.—The company's cable between Wladiwostock and Nagasaki has been repaired, and communication by this company's route with all stations in China and Japan is therefore re-established.

THE EASTERN TELEGRAPH COMPANY, LIMITED.—The directors of this company have issued their report and balance sheet for the six months ended 30th September, 1881. The company's revenue for the period amounted to £282,834 8s. 9d., from which are deducted £67,498 5s. 5d. for the ordinary expenses, and £47,228 15s. 5d. for expendidure relating to repairs to and laying of new cables during the half-year. After providing £3,040 14s. 4d. for income tax, there remains a balance of £165,066 13s. 7d., to which is added £2,723 6s. 7d. brought from the preceding half-year, making a total available balance of £167,790 0s. 2d. From this balance £22,726 9s. 2d. has been paid for interest on debentures, and £20,559 1s. 6d. for dividend to 30th September, 1881, on the preference shares, leaving a balance of £124,504 9s. 6d., out of which the directors have paid two interim dividends on the ordinary shares for the quarters ending 30th June and 30th September, 1881, amounting together to £95,000, leaving a balance of £29,504 9s. 6d. to be carried forward to next account. It will be observed that since the last report the directors have issued the balance of 700 ordinary shares, making the total ordinary capital £3,800,000. The several sections of the company's cables are in good working order, with the exception of the direct Lisbon line, which is now under repair. Reference was made at the last general meeting of shareholders to the interruption of the cables between Aden and Bombay, which had occurred in shallow water close to Bombay. Notwithstanding the prevalence of the south-west monsoon, communication was temporarily restored on one of the cables on 10th August last, by the company's repairing staff, sent from Aden, and the use of the P. & O. steamships *Geelong* and *Timsah*. Subsequently, on the 25th August, the second cable was temporarily repaired by the s.s. *Great Northern*, belonging to the Eastern and South African Telegraph Company, from Zanzibar. On the arrival of this company's s.s. *Chiltern* at Bombay with new shore ends, they were permanently laid in a carefully selected channel. The presence of the two steamers enabled this to be done without any delay to the traffic.

CABLE NEWS.—The *Morna*, the temporary cable repairing ship of the Post-office, arrived in the Thames on Sunday morning. The *Tirante*, chartered by the West India and Panama Telegraph Company, is now taking in the 300 miles of cable manufactured for them at Silvertown. The steamship *International*, engaged upon the Central and South American Company's Cables, arrived at Kingston (Jamaica), on Saturday last, on her homeward voyage. Mr. Theophilus Smith, who was engineer in charge, together with the staff, left Kingston on the following morning by Royal Mail, to join Mr. Falconer King, in the *Dacia*, at Payta (Peru). On the 24th inst. the Silvertown Company received a telegram stating that the *International* left Kingston on that day for London. The operation for coiling the cable of the West India and Panama Company on board the *Tirante* was completed on Thursday last. This steamer of 1,168 tons gross, was fitted up with cable tanks by Messrs. W. T. Henley & Co. Some shore end and intermediate cable, manufactured by Mr. Henley, for the above company, is also sent out. During the manufacture and shipment of these cables, Sir Samuel Canning and Mr. Robert Sabine looked after the interests of the West India and Panama Company, and together with Mr. Hooper, the Secretary, superintended the necessary arrangements of the vessel.